Spitzer/MIPS Photometry of the Extrasolar Planet HD 209458b During Secondary Eclipse

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The thermal infrared (IR) flux emitted by a transiting extrasolar planet can in principle be measured by detecting the secondary eclipse, when the planet passes behind the star and re-emerges. For the "hot Jupiter" class of extrasolar planets, the fractional change in the combined IR light of the system during secondary eclipse is predicted from some models to be in the range of 0.2-0.4 percent. This is orders of magnitude greater than the infrared flux expected from both giant extrasolar planets at larger orbital radii, as well as from terrestrial extrasolar planets. The secondary eclipse of the brightest transiting system (HD 209458) was the target of our General Observer program using the MIPS photometer on the Spitzer Space Telescope, at a wavelength of 24 microns. An approximately 6-hour sequence of over 1700 10-second exposures, centered on phase 0.5, was obtained by Spitzer in December 2004, and analysis of these data is currently underway. A preliminary assessment, as of January 2005, indicates that the sensitivity will be limited by the statistical fluctuations in the thermal emission from zodiacal dust in our own solar system, with the limiting sensitivity being sufficient to detect the secondary eclipse if the planet is as hot as predicted by several models (> 1200 Kelvins). We will present our final results, and discuss the prospects for follow-up observations of infrared radiation from transiting extrasolar planets using the James Webb Space Telescope.